BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

INDIAN AND NORTHERN AFFAIRS CANADA

POLARIS MINE, CLOSURE MONITORING

SEPTEMBER 9, 2004 SITE VISIT REPORT

FINAL

PROJECT NO.: 0131-013-01
DATE: NOVEMBER 3, 2004

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Project No. 0131-013-01
Date: November 8, 2004

Mr. Carl McLean
Manager Land Administration Operations
Indian and Northern Affairs Canada
Building 918
P.O. Box 100
Iqaluit, NU X0A 0H0

Re: Polaris Mine- Closure Monitoring, September 9, 2004 Site Visit Report

Dear Carl:

Please find attached one hard copy and one CD copy of our above referenced report dated November 8, 2004. As noted on the distribution list, I have forwarded two copies to the Nunavut Water Board as well.

If you have any questions or comments, please do not hesitate to contact me at the number listed above.

Yours truly,
BGC Engineering Inc.
per:

Nunavut Water Board
NOV 18 2004
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NUNAVUT WATER BOARD
SCANNED
NOV 18 2004
REF. #

Holger Hartmaier, M.Eng., P.Eng.
Senior Geotechnical Engineer

cc. Nunavut Water Board- Patrick Duxbury, Mine Reclamation Coordinator
Dionne Filiatrault, Senior Technical Advisor

HHH/sf

TABLE OF CONTENTS

APPENDICES

LIMITATIONS OF REPORT

This report was prepared by BGC Engineering Inc. (BGC) for the account of ***Indian and Northern Affairs Canada***. The material in it reflects the judgement of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be based on it are the responsibility of such Third Parties. BGC Engineering Inc. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

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1.0 INTRODUCTION

Indian and Northern Affairs Canada (INAC) has retained BGC Engineering Inc. (BGC) to ensure that Teck Cominco Ld. (TCL) meets their obligations for closure and restoration as required by the approved closure plans under the land leases and water licence for the Polaris Mine. Included in BGC's scope of work is the verification of the implementation of all aspects of the approved closure plan. As part of this verification process, two site visits were scheduled in 2004. The first site visit took place June 20-22, 2004 and is reported under separate cover (BGC, 2004).

The September 2004 site visit was scheduled to coincide with the completion of on-site reclamation work, in order to review site conditions upon demobilization of the prime reclamation contractor, SNC-Lavalin from the site. The last load was shipped off site on September 10, 2004.

This memorandum summarizes the observations made on what is considered to be the final inspection of the site by BGC with respect to the closure activities. The site visit was arranged by INAC and coordinated with TCL to coincide with the completion of site activities. Since no permanent camp facilities exist at the site, the site inspection visit was conducted on a single day. The following individuals participated in the inspection:

- Mr. Carl McLean, INAC, Manager Land Administration Operations.
- Mr. Jim Noble, INAC, Resource Management Officer III.
- Mr. Constantine Bodykevich, INAC, Water Resources Officer.
- Mr. Lou Spagnuolo, INAC, Contaminated Sites Project Officer.
- Ms. Tanya Gordanier, Fisheries and Oceans Canada, Habitat Biologist.
- Dr. Alexandre Tchekhovski, AMEC, Senior Permafrost Engineer.
- Mr. Holger Hartmaier, BGC, Senior Geotechnical Engineer.

The TCL representatives on site conducting the tour were:

- Mr. Bruce Donald, Reclamation Manager, and
- Mr. Ian Dickie.

The purpose of the site visit was to inspect all areas of the mine site to assess the final reclamation conditions and to identify any outstanding issues and concerns. TCL has left some trailers and equipment on site for monitoring and any post-reclamation maintenance work that may be required. Five quads were also left on site for transportation.

1.1 Itinerary

The inspection team travelled to Resolute Bay by chartered aircraft from Iqaluit on September 9, 2004. At Resolute Bay, the inspection team was met by Mr. Bruce Donald and Mr Ian Dickie, who accompanied the inspectors to Polaris. The group arrived at Polaris at about 9:30 A.M (all times EDST). The weather at the site was windy, with a temperature of about -7^{O}C. Drifting snow from a recent snowfall was accumulating in low and leeward areas. However, most the site was essentially bare of snow.

Four of the five quads on site were available for transportation. The tour was conducted in two groups, in order to share the quads. The temporary site trailers were used as a base to warm up by one group, while the other group went out to inspect a portion of the site. The entire site inspection was completed by 5:00 P.M.

The charter returned to Resolute Bay to drop off the TCL representatives, then continued on to Iqaluit that evening.

2.0 OVERVIEW

The reclamation work at the site is essentially completed. The final stages of work carried out since the last site visit included:

- Completion of the marine dock and shoreline reclamation, including removal of all buildings.
- Removal of the tank farm.
- Demolition and removal of the accommodation complex.
- Clean up of a small area of hydrocarbon contamination adjacent to the accommodation complex.
- Closure of all underground mine portals.
- Disposal of remaining hydrocarbon contaminated soils into the raise bore holes.
- Clean up of one additional metals contaminated area.
- Decommissioning and re-contouring of roads and other areas.
- Placement of demolition debris and metals contaminated soils into Little Red Dog (LRD) Quarry and construction of final cover.
- Removal of the water intake pumphouse at Frustration Lake and water line. The freshwater tank on the hill was the last permanent structure to be demolished.

Equipment and supplies were taken down to the ship loading area, located on Polaris Bay, adjacent to the Operational Landfill. TCL was not able to sample Garrow Lake this summer as the ice never left the lake. TCL left six small trailers on site (exploration camp from Stuart Bay) as well as the Skidozer required for sampling during the winter on Garrow Lake. In addition, one bulldozer, a dump truck and an excavator were left on site to take care of any post-closure maintenance work that may be required. Adjacent to the temporary camp area, TCL have left several sea cans containing spare parts as well as three above ground tanks within a bermed area.

3.0 SITE INSPECTION OBSERVATIONS

3.1 Frustration Lake Water Intake

The access road base has been cut down and several swales have been cut across the road to re-establish drainage. The route is still drivable by quad.

The Frustration Lake causeway has been levelled off and all the water pipe removed. The pumphouse at the intake has been demolished and removed.

3.2 Garrow Lake Dam

The access roads have been decommissioned, but are still drivable by quad.

During the summer, flow through the breach and re-instated Garrow Creek channel occurred as the ice was breaking up on the lake. At the time of the inspection however, the creek bed was dry. The channel rip rap and side slopes appeared to be in good condition, with no signs of cracking, sloughing or erosion.

Some ice-rich piles of soil remain to be removed on the upstream side of the dam on both sides of the creek. TCL has committed that these will be removed and re-contoured over the next few years as the ice melts out and the soil can be drained.

A surface coating of rusty coloured soil was noted on the exposed former lakebed sediments upstream of the dam. The cause of the rusty colouration was not known at the time of the inspection; however TCL reported that samples had been taken for analysis. In addition, INAC also obtained samples of this material for analysis. The concern is that this material may be oxidized tailings that have migrated out of Garrow Lake. It is expected that the results of these analyses will be used by TCL to confirm if any additional remediation is required.

Downstream of the breached dam, TCL placed limestone rip rap across the flat area along the right bank of the creek. This area was very wet and soft during the last (June 2004) inspection, due to natural runoff coming from the higher ground to the west of Garrow Creek. TCL also placed rip rap and rockfill into the ditch which diverts runoff around the right side of the dam. The placement of rockfill was done to reduce the overall gradient in the ditch and reduce erosion. During the previous inspection, it was noted that there was a significant amount of natural overland runoff entering Garrow Creek downstream of the rip rapped bank area, and that this would be contributing a significant component of suspended sediment from outside the disturbed footprint of Garrow Lake Dam. No further action would be necessary to remediate the runoff from the natural area.

3.3 Wave Break Structure

The closure plan calls for Garrow Lake to be lowered back to the natural lake level that existed prior to constructing Garrow Lake Dam. At the time of the inspection, TCL noted that the level of Garrow Lake was about 0.6 m below the former natural lake level. As a result, TCL has added some material to the channel to allow Garrow Lake to rise back to its natural lake level for closure. During the flow season over the summer, high velocities through the narrow wave break breach resulted in scour and disturbance of the natural channel. As a result, the channel became too deep and the lake drained below the former natural lake level set for closure.

To prevent this from occurring in the future, TCL has increased the width of the breach and raised the channel invert. Now that lowered lake conditions have been achieved, the gradient across the breached wave break structure should be small and future seasonal flows will occur in the re-instated natural channel without further disturbance. It was noted that the channel downstream of the wave break structure has become self-armoured as a result of the higher than normal flows in 2004. Monitoring of this area is recommended by BGC during the open water season to ensure that the breached channel remains stable. TCL should be prepared to widen the channel and/or place additional rockfill if the channel becomes eroded below the design invert elevation.

The rusty coloured soil noted on the former lakebed sediments at Garrow Lake Dam was also noted here. Samples were taken by INAC and TCL for analysis.

3.4 Tailings Thickener Area

All the berms have been knocked down and the area has been recontoured. No further work is required.

3.5 Operational Landfill

The road from the temporary camp to the Operational Landfill and airstrip has been retained more or less intact.

Since the last inspection, TCL has placed a layer of finer grained rockfill on top of the cover to fill in the erosional depressions noted along the south slope.

New thermistors will be installed to monitor temperatures in the cover. BGC recommends that these instruments also be equipped with data loggers, if not already included.

3.6 Incinerator and Tank Farm Area

The road from the Operational Landfill down to the south end of the marine foreshore area remains essentially intact.

The slope between the road and bench where the incinerator was located appears to be too steep and should be flattened.

Similarly, the slope below the tank farm area should be flattened as well. Bedrock is exposed in the backslope above the tank farm area and no further work is necessary there.

3.7 Concentrate Storage Shed/Barge Area

Since the last inspection, the foundation columns have been removed and the entire site has been graded and contoured. The entire area is covered with natural beach gravel that extends over the entire marine foreshore area. Although the level ground in this area is traversable by quad, the road network in the marine foreshore area has been completely removed.

3.8 Shoreline and Cellular Dock Structure Area

The entire beach front looks natural and has been restored with beach gravel. A minor plume of suspended sediment was noted along the wave break zone. No specific action was recommended at this time; however, BGC recommends that this area be monitored to assess the performance of the re-instated beach.

3.9 Portals

The mine portals have been backfilled and the exterior fill has been sloped and contoured. The Exploration Portal backfill appeared to be too steep for the fine material used. At the Main Portal, the upper crest of the slope above the portal should be bladed down.

Some steel reinforcing bars were noted sticking out of rock in several areas in the rock cuts adjacent to the Main and Exploration portals. These should be removed for aesthetic and safety purposes.

The North Portal area appears satisfactory. The slope over the backfilled area blends completely into the surrounding slopes and there is no way to recognize the location of the portal.

BGC would like to review the as-built drawings for the portal closure, so that the final specifications and details can be compared with the design drawings reviewed previously, on behalf of INAC.

3.10 LRD Quarry Landfill

The road from the Main Portal to the LRD quarry has been completely decommissioned and removed in the area adjacent to the Main Portal. Further to the north, the bench containing the road remains and access is possible by quad into LRD quarry from the top of the slope.

The slopes between the Main Portal and the LRD quarry have been regraded and contoured and appear in a satisfactory condition.

The cover on the LRD Quarry was completed. TCL noted that it was a minimum of 1.8 m thick, which is the design specification, but may be up to 2.25 m thick along the pit wall. TCL should prepare as-built drawings to record the final construction details.

Thermistors were not yet installed in the pipes going through the cover.

3.11 Accommodation Complex

The accommodation complex has been completely removed. No follow-up work is required. The water tower and piping adjacent to the airstrip has also been removed.

3.12 Airstrip

The airstrip remains intact and will be required for access to the site in the post closure period. The skidozer and the quads are stored alongside the airstrip. In addition, a couple of skid mounted shacks as well as about four pallets of fuel drums were located adjacent to the aircraft parking area on the airstrip.

3.13 New Quarry and Subsidence Area

Some material was recently removed from the stockpile of shale in the New Quarry. As a result, the slope of the stockpile was left in an over-steepened state. This should be re-graded and re-contoured at the next opportunity.

TCL completed a surface survey over the subsidence area after completion of the grading and contouring as part of the long term monitoring of this area. A report by Golder Associates on the assessment of the subsidence area is still pending.

TCL also excavated several test pits in the area to check cover thickness over the waste and address concerns raised previously by BGC and INAC. In some areas, the test pits found less than the minimum 1.8 m of cover and additional shale cover was placed.

In some areas, small pieces of scrap metal were noted laying on the ground surface, or sticking out of the ground. TCL indicated that they would gather this material up over the post closure period while they were on site. This could be done by a couple of labourers over the course of a few days while other work was being done on site during the summer months. A cutting wheel may be required to cut of some of the steel items protruding above the ground surface if they are frozen in, so they don't pose a safety hazard.

4.0 RECOMMENDATIONS

In general, the abandonment and reclamation work appears to be satisfactory and complete. Several areas of follow up were noted, as follows:

- Flatten slope below bench where incinerator building was located.
- Flatten slope below bench where tank farm was located.
- Flatten slope of backfill material used to close the Exploration Portal.
- Blade down crest of slope above Main Portal.
- Remove reinforcing steel from rock slopes adjacent to Main and Exploration portals.
- Remove any scrap metal from the surface of reclaimed areas, for safety and aesthetic purposes.
- Remove soil piles on upstream side of Garrow Lake Dam as they thaw and drain.
- Report on subsidence assessment by Golder.
- Report on analysis of rusty coloured sediments in Garrow Lake.
- Provide as-built details for closure of portals.
- Provide as-built details for final cover at LRD Quarry.
- Install thermistors and data loggers in Operational Landfill and LRD Quarry.
- Monitor outflow from Garrow Lake through the wave break structure to assess if channel is being eroded and remediate if necessary.
- Monitor marine foreshore to assess stability of re-instated beach area.

In addition, TCL still needs to forward the close out reports to INAC for the individual areas of metals and hydrocarbon contamination that were remediated, as well as the remaining quarterly reports.

5.0 CLOSURE

The September 9, 2004 site visit represents the final inspection visit for the abandonment and reclamation work at Polaris. More work will be required during the post-closure phase and as a result, TCL have left a temporary camp and equipment on site. In general, most of the remaining work, in addition to the post-closure monitoring requirements is cosmetic in nature, involving minor slope flattening and contouring. Follow-up inspections on these areas can be done by INAC staff, as required. BGC can attend these inspections if requested.

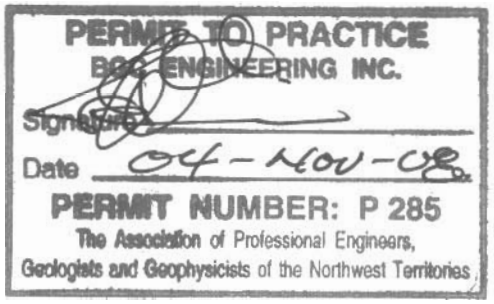
We trust the above report meets with requirements at this time. If you have any questions or require further information, please do not hesitate to contact BGC at your convenience.

BGC Engineering Inc.
Per:

Holger Hartmaier, M.Eng., P.Eng.
Senior Geotechnical Engineer

Reviewed by:

James W. Cassie, M.Sc., P.Eng.
Specialist Geotechnical Engineer



REFERENCES

BGC Engineering Inc., 2004, June 20 to June 22, 2004 Inspection Trip Report, prepared for Indian and Northern Affairs Canada.

APPENDIX I – PHOTOGRAPHS- SEPTEMBER 9, 2004